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ABSTRACT

Federal Tax Autonomy and the Limits of Cooperation

by Sebastian G. Kessing, Kai A. Konrad and Christos Kotsogiannis

We consider the hold-up problem between a foreign direct investor and the government(s) in a host country with weak governmental structure and lack of power to commit. Using "Nash threats", we show that an efficient investment level can be sustained for a sufficiently high discount factor and ask whether a federal structure makes collusion more or less sustainable. We show that collusion between the government and the investor is easier to sustain if the host country is more centralized or if the government layers can commit to fixed sharing rules.

Keywords: Tacit collusion, foreign direct investment, hold-up problem, federalism, vertical tax externality, tax competition

JEL Classification: H11, H71, H73, H77

ZUSAMMENFASSUNG

Föderale Steuerautonomie und die Grenzen der Kooperation

Wir betrachten das „Hold-up Problem“, das in den Beziehungen zwischen einem ausländischen Investor und der Regierung, bzw. den Regierungen eines Gastlandes mit schwachen institutionellen Strukturen besteht. Unter Verwendung von Nash-Drohungen wird gezeigt, dass eine Überwindung des Hold-up Problems durch wiederholte Interaktion zwischen den Akteuren möglich ist. Weiterhin wird untersucht, ob föderale Strukturen eine solche Überwindung wahrscheinlicher machen oder nicht. Schließlich wird gezeigt, dass eine Überwindung des Hold-up Problems besser gelingt, wenn die verschiedenen Regierungsebenen des Gastlandes sich bindend auf eine gemeinschaftssteuerliche Aufteilung des Steueraufkommens festlegen können.

1 Introduction

Foreign direct investment (FDI) is notoriously prone to risk. Once the investment is made, a large share of it is sunk, and the expected returns from the investment may be diluted by changes in the host country's policy. This creates a hold-up problem, and some aspects of this problem have been carefully studied.[1] Federalism and decentralisation are often regarded as important policy instruments for overcoming this obstacle to FDI. For example, in its latest World Development Report, which focusses on measures to foster investment, the World Bank highlights decentralization of policy-decision making as conducive to attracting FDI. For, as it is argued, decentralization 'permits a degree of institutional competition between centers of authority that can... reduce the risk that governments will expropriate wealth' (World Bank, 2004, p. 53). This view is rooted in the notion that competition between jurisdictions for mobile factors of production, coupled with joint accountability of the levels of governments, makes ex-post opportunistic behavior more difficult, (Weingast (1995), and Quian and Weingast (1997)).[2] As Weingast (1995, pp. 5-6) most vividly puts it:

> 'If a jurisdiction attempts to confiscate the wealth of an industry, the mobility of capital implies that firms will relocate. The mobility of resources thus raises the economic cost of those jurisdictions that might establish certain policies, and they will do so only if the political benefits are worth these and other costs. Federalism thus greatly diminishes the level of pervasiveness of

[1] See, for instance, among others, Eaton and Gersovitz (1983), Doyle and van Wijnbergen (1994), Thomas and Worrall (1994), Konrad and Lommerud (2001), Janeba (2000) and Schnitzer (1999, 2002).

[2] This view can be traced back to Hayek (1939) and Tiebout (1956). That inter-jurisdictional competition may serve as a welcome supplement to inadequate constitutional constraints and imperfect political institutions has also been emphasized by Brennan and Buchanan (1977, 1980).

economic rent-seeking and the formation of distributional coalitions.'

This argument is important, and certainly applies to many types of investment, particularly human capital investment that, with its owner or owners, can easily relocate.

However, once an international investor has invested in a given country the hold-up problem is rooted in the immobility of capital. This casts doubt on the plausibility of the argument that federal structures per se will attenuate the hold up problem. Does an increase in the number of competing government actors actually reduce the likelihood of a hold-up and increase investment levels? The aim of this paper is to analyze this question rigorously. As stressed in previous work, the main element that prevents governments from expropriation and confiscatory taxation is the prospect of future benefits from repeated investment (see, e.g., Eaton and Gersovitz (1983) or Thomas and Worrall (1994)). We consider a simple framework of repeated interaction between the foreign investor and the host country government(s), which allows us to investigate whether a multi-layer structure of government facilitates reaching efficient FDI levels. We show that the opposite is true. Federal countries, i.e. countries with a higher number of independent government levels, are less likely to achieve efficient levels of FDI. The reason is that, for each individual layer of government, the incentive to deviate from the collusive outcome between governments is increased, and the future losses are reduced.

Repeated interaction and 'tacit collusion' that could be sustained in infinitely repeated games has received limited attention in the public finance literature on tax competition. Haufler and Schjelderup (2004), for instance, consider commodity taxation in the context of an industry structure in which firms may coordinate on a collusive outcome in an infinitely repeated game. We consider collusion between the various layers of government and the firm aimed at overcoming the hold-up problem, not the problem of forming or

sustaining an industry cartel in oligopolistic markets. The question then becomes whether collusion between the foreign direct investor and the government becomes more or less difficult if the government consists of more than one decision maker. We use a reduced-form model of federal fiscal arrangements within which the relationship between federalism and the likelihood of tacit collusion can be articulated. We ask: does decentralization (multi-level governance) enhance the range of discount factors that make tacit collusion between the levels of government and an efficient investment level feasible, thereby making the federal economy a more attractive place for FDI? We show that collusion is more difficult, the more decentralized the policy-decision making is.[3]

As an alternative to competition between independent layers of government, we consider revenue sharing and find that appropriate and reliable sharing rules make ongoing investment more likely to be sustainable than in a situation in which all levels of government exercise their power to tax. Also, with sharing rules in place, an increase in the number of government actors does not affect investment negatively. A reduction in competition between government levels can make investment more likely and contribute to overcoming the hold-up problem in foreign direct investment.

Our analysis can be seen as a contribution to a literature that has recently highlighted several problematic aspects of decentralization and that has also tried to single out more precisely the specific conditions and institutional provisions that are necessary for federalism to unleash its potential for improving countries' economic performance. For instance, an important feature of the preceding usual efficiency argument for decentralization ('federalism') is that it is developed in a hierarchical system within which there is a clear di-

[3]The problem is structurally related to the discussion in the context of competition theory on the sustainability of collusion among firms (see, e.g., Tirole 1988, pp. 245n.), in which the number of competitors plays a critical role. The main difference between collusion in the hold-up problem and the collusion-in-oligopoly-markets problem is the existence of the investor—the other side of the market—as an additional player.

vision of powers, in which all spillovers, including vertical fiscal externalities are absent by assumption or are contracted away. Vertical fiscal externalities have recently been identified as a source of inefficiency in the context of tax competition (see, for instance, among others, Wrede (1997, 2000) and Keen and Kotsogiannis (2002, 2003, 2004)) and it has been argued that they are difficult to avoid, even if seemingly different tax bases are assigned to different layers of government. Kessing, Konrad and Kotsogiannis (2005) considered competition for FDI in a static fully non-cooperative tax-competition framework and show that vertical interdependencies in a federally organized host country puts such a country in a disadvantaged position vis-a-vis unitary states. They also provide empirical evidence that, for transition countries, the number of government layers affects the level of FDI inflows negatively. Treisman (1999a, 1999b, 2002, 2003) has put forward a number of further arguments why decentralization may lead to a less satisfactory performance, and Cai and Treisman (2002) show that the disciplinary effect of interregional competition, even where it could be at work in principle, may lead to adverse effects if regions are asymmetric, making some of them drive out all mobile capital and specialize on a high level of oppression. This and other consequences of a federal structure may also reduce FDI. Their argument addresses the alleged benefits from horizontal interregional competition. We concentrate on the aspect of vertical disintegrated government systems.

Our results are directly relevant for the increasing amount of evidence that the organisation of inter-governmental fiscal relations plays a crucial role for investment, tax revenues and overall economic performance of transition and developing countries. The cases of Russia and China have received particular attention, see Zhuravskaya (2000), Berkovitz and Li (2000) and Jin et al. (2004), among others. The success of the fiscal arrangements of local governments with higher levels of government in China stands in contrast to the disarray of federal fiscal relations in Russia. Jin et al. (2004) document the reliability and durability of a system of revenue sharing between the lo-

cal governments and higher levels of government in China. By contrast, as analyzed by Berkovitz and Li (2000), Russia suffered from a common pool tax problem. Our results on the beneficial effects of sharing rules provide a clear explanation for the success of the Chinese fiscal arrangements which can be contrasted with the problems in Russia that follow our analysis of the effects of independent taxation in federal systems on the hold-up problem.[4]

Section 2 develops the analytical framework and explores the potential for tacit collusion. Section 3 considers revenue sharing and section 4 concludes.

2 The hold-up problem and cooperation

We consider an economy with a hierarchy of n symmetric and fiscally autonomous levels of government, and with one governmental player on each level of government.[5] For $n = 1$ this structure refers to a unitary system of governance whereas for $n > 1$ it refers to a federation with several layers of government. There is a common tax base from which each level of government draws its revenues. To address the issue of whether collusive behavior in the repeated game between a foreign direct investor and the government(s) in the host country is more easily sustained in a federal or a unitary country, the analytical framework makes use of some of the elements and assumptions introduced in Eaton and Gersowitz (1983). We consider a foreign direct in-

[4] As described by Shleifer and Treisman (2000), revenue sharing also existed in Russia for some taxes. However, the existing sharing schemes suffered from unreliability, offsetting changes in fiscal tranfers from higher levels of government, and other forms of negative effects. This points to the problem of establishing reliability of such schemes in the context of host countries with weak institutions in the first place, a problem that will not be discussed in our analysis.

[5] Intentionally, we abstract from the fact that, typically, lower levels of government do not consist of one government, but of a larger number of regional governments with non-overlapping jurisdictions. Qualitatively our results generalize, as long as once the investment decision is made the foreign direct investment is fixed and cannot move from one region to another.

vestor who repeatedly makes an investment and chooses whether, and how much, to invest in a host country in periods $j = 1, 2, \ldots$. The returns to investment accrue in each period j and they are subject to taxes in the host country.

The stage game Consider the stage game in period j. The timing within the period is as follows. First the investor chooses an amount $k_j \geq 0$, at the beginning of the period. This investment is irreversible and the cost is sunk once the investment is made. The cost is given by

$$C(k_j) = k_j^2, \quad \text{for periods} \quad j = 1, 2, \ldots \tag{1}$$

and is fully born by the investor and investment is fixed for the rest of the period and fully depreciates at the end of period j. Accordingly, investment in any given period j does not directly affect the capital stock in future periods. The investment yields a return at the end of period j and this return is proportional to the size of the investment, and equal to ak_j, with $a > 0$. The return to investment accrues in units of the universal good that is freely transferable across country borders.

Once the investment choice is made and observable, each of the n government layers i in the host country chooses its action γ_j^i , with $\gamma_j^i \in [0, 1]$. This γ_j^i is called the share in the investment return that is demanded by government i, or government i's *demanded share*. These share demands translate in tax shares, as follows. The *actual tax rate* t_j^i, and hence, the share in the gross returns received by government i in period j is

$$t_j^i = \begin{cases} \gamma_j^i & \text{if} \quad \sum_{k=1}^{n} \gamma_j^k \leq 1 \\ \dfrac{\gamma_j^i}{\sum_{k=1}^{n} \gamma_j^k} & \text{if} \quad \sum_{k=1}^{n} \gamma_j^k > 1 \end{cases} . \tag{2}$$

The function in (2) says that $t_j^i = \gamma_j^i$ and each government i receives a share in the returns that equals the share it demands if the sum of all allocations

chosen by all n governments does not exceed 100 percent. If, on the other hand, the sum of the allocations exceed 100 percent, then each government is rationed and the rationing mechanism in (2) suggests that each receives only a constant fraction of its chosen share.[6]

Once the shares demanded are chosen, the actual taxes t_j^i can be calculated. The returns from investment accrue and are allocated between the investor and the different layers of government according to $(t_j^1, ..., t_j^n)$, and this allow the period payoffs of the investor and the different government layers to be stated. For this purpose, define

$$t_j = \sum_{i=1}^{n} t_j^i \tag{3}$$

to be sum of actual tax rates, and, hence, the aggregate share of gross returns transferred to the governments. Recall that the levels of government share in the gross return but not in the investment cost that generates this return.

The foreign investor cares about the return net of taxes and net of investment cost. Accordingly, the period j surplus of the investor is

$$\pi_j = (1 - t_j)ak_j - k_j^2 \ . \tag{4}$$

Government i in period j receives payoff equal to its tax share in the gross return[7] and is given by

$$T_j^i = t_j^i ak_j \ . \tag{5}$$

Before turning to the collusion outcomes, consider the Nash equilibrium outcome, denoted by an $(^*)$, of the single-shot stage game.

[6] One could certainly think of other functions specifying other rationing rules. But the results are qualitatively similar for other share functions, provided that t_j^i increases in the government's own desired share γ_j^i, and decreases in other governments' desired shares.

[7] Although this preference specification is restrictive, the introduction of benevolent governments that redistribute their tax revenues as public goods will yield similar results, but at the cost of cumbersome analytics.

Proposition 1 *In the subgame perfect equilibrium of the single-shot stage game, the investor chooses* $k_j^* = 0$. *Governments choose* $\gamma_j^{i*} = 1$ *if* $k_j > 0$ *and* $\gamma_j^{i*} \in [0,1]$ *arbitrarily if* $k_j = 0$. *The equilibrium payoffs are uniquely determined as* $k_j^* = \pi_j^* = T_j^{i*} = 0$.

Since investment is made and is sunk, whenever there is some revenue, the governments will maximize their own share in the gross revenue from the investment. Hence, all positive revenue will be fully confiscated. The investor, anticipating this expropriatory behavior, optimally chooses an investment that is equal to zero, which, in turn, generates zero gross returns and zero payoffs for all players in the game. This Nash equilibrium is unique in its payoffs.

Infinite repetition Turn now to the case in which the stage game is infinitely repeated. Note first that play as in the single-shot stage game constitutes a subgame perfect equilibrium of the infinitely repeated game. A switch to this subgame perfect equilibrium for all future periods will be used as the threat to establish tacit collusion.

We consider conditions for which the fully efficient investment level can be supported as a subgame perfect equilibrium, assuming that players switch to the unique subgame perfect equilibrium that is characterized in Proposition 1 for all periods $j_{0+1}, j_{0+2}, \ldots$ if a deviation occurs in period j_0. This reversion to the Nash equilibrium of the single-shot game, once a deviation has occurred, is a standard example of a credible penal code proposed by Friedman (1971).

First we characterize the set of efficient allocations in any period (stage game) obtained from maximizing the sum of each and every period j payoffs given by (4) and (5) for all $i = 1, \ldots, n$, that is

$$\pi + \sum_{i=1}^{n} T^i = ak - k^2. \tag{6}$$

The period subscript is suppressed here and in much of what follows. The investment choice that maximizes (6) is unique and equal to

$$k = \frac{a}{2} \, . \tag{7}$$

Turning to collusive equilibria, we focus on stationary equilibria, that is, on equilibria in which the tax rates and capital choices are constant over time, and on equilibria that are symmetric with respect to the different governmental bodies that is, on equilibria in which $\gamma_j^i = \gamma_j/n$ for all periods j. The period payoffs in a symmetric stationary equilibrium that supports efficient investment are given by

$$\hat{\pi} = \left(1 - \hat{t}\right) \frac{a^2}{2} - \left(\frac{a}{2}\right)^2 \, , \tag{8}$$

for the foreign direct investor, and

$$\hat{T}^i = \frac{\hat{t}}{n} \frac{a^2}{2} \, , \tag{9}$$

for government i, $i = 1, \ldots, n$, where the 'hat' denotes these equilibrium values. In any collusive stationary symmetric equilibrium, the investor must receive at least a zero payoff, as he can obtain this payoff regardless of the governments' demands by simply not investing. Hence, an upper limit for the aggregate tax that is compatible with a stationary collusive equilibrium with efficient investment by the foreign direct investor is the level of tax $\hat{t}$ that makes the payoff in (8) equal to zero. This aggregate tax rate is given by

$$\hat{t} = 1/2 \, . \tag{10}$$

Denoting the discount factor for all players by $\delta \in (0, 1)$, and assuming that δ is time invariant and the same for all players, the discounted present value of the sum of all period payoffs is obtained by multiplying $\hat{\pi}$ and $\hat{T}^i$ with $\frac{1}{1-\delta}$. We can now state the following proposition:

Proposition 2 *Consider the set of stationary symmetric subgame perfect equilibria which are characterized by* $(\breve{k}, \breve{t})$ *and by reversion to the non-cooperative stage game for all future periods* $j_1, j_2, ...$ *if* $(k_{j0}, t_{j0}) \neq (\breve{k}, \breve{t})$. *Efficient investment (7) and tax revenues (10) can be sustained as such an equilibrium, denoted as* $(\hat{k}, \hat{t})$, *if*

$$\delta > 1 - \frac{3}{4n} + \frac{1}{4n^2} \equiv \hat{\delta}(n). \tag{11}$$

Proof. It follows from stationarity, symmetry and equations (9) and (10) that in the collusive equilibrium $(\hat{k}, \hat{t})$, the present value of the sum of period payoffs for each single government i, $i = 1, \ldots, n$, is given by

$$\frac{1}{1-\delta}\frac{1}{n}\frac{a^2}{4}\ , \tag{12}$$

and the present value of the sum of period payoffs of the investor is zero. To see whether this equilibrium can be sustained, we need to compare it with the outcome from a unilateral deviation, for each player, in a given period. Consider, first, deviations by the investor. If the investor deviates from $k_j = a/2$ in a given period j, as all players anticipate that all players' period payoffs in all future periods will be zero, subgame perfect equilibrium tax choices in period j will imply that government i, $i = 1, \ldots, n$ demands $\gamma_j^i = 1$, and thus each receives a share $1/n$ of the gross returns of the investment, whereas the investor makes a non-positive payoff or loss from his investment equal to his investment cost. Accordingly, the investor has no incentive to deviate from this candidate equilibrium.

Turn to a government h. A unilateral deviation from $\hat{\gamma}_j^h = \frac{1}{2n}$, taking into consideration that other governments choose $\hat{\gamma}_j^i = \frac{1}{2n}$ for $i \neq h$, and, hence, $\sum_{k\neq h}^{n} \hat{\gamma}^k = (n-1)/(2n)$, following (2), the deviation that yields h the highest share in the given investment returns is $\gamma_j^h = 1$ and yields $\bar{t}_j^h = (2n)/(3n-1)$ and period profit denoted by $\bar{T}_j^h$, equal to

$$\bar{T}_j^h = \frac{2n}{3n-1}\frac{a^2}{2}\ , \tag{13}$$

and zero period tax revenues and profits in all future periods. Here the 'bar' denotes variables that relate to the optimal unilateral deviation by one player. A comparison between (12) and (13) reveals that a deviation from the collusive outcome is profitable for a typical government h if and only if

$$\bar{T}_j^h \equiv \frac{2n}{3n-1}\frac{a^2}{2} > \frac{1}{1-\delta}\frac{1}{2n}\frac{a^2}{2} = \frac{1}{1-\delta}\hat{T}^h \ . \tag{14}$$

The maximum discount factor for which inequality holds in (14) yields the maximum discount factor, denoted $\hat{\delta}(n)$, as in (11). □

Proposition 2 shows that governments and the investor can tacitly collude and overcome the hold-up problem if $\delta > \hat{\delta}$, based on what is sometimes called a "Nash-threats" folk theorem (Fudenberg and Tirole, 1991, p.154). As is well known, reversion to the subgame perfect equilibrium in which the non-cooperative stage game equilibrium is played for all times is a reasonable assumption, but it is often not the only reasonable punishment strategy. However, it yields a simple and important benchmark case that can be used to carry out comparative statics.

Equipped with Proposition 2, we ask whether sustainability of the collusive outcome becomes more difficult with an increase in the number of governments. The answer to this is affirmative. To see this, differentiate the right hand side of (11) with respect to the number of governments, n, to obtain

$$\frac{d\hat{\delta}(n)}{dn} = \frac{3n-2}{4n^3} > 0 \ . \tag{15}$$

We state this is as a proposition:

Proposition 3 *The collusive outcome that is characterized in Proposition 2 is sustainable for a lower discount factor the smaller the number of government layers in the host country.*

Intuitively, if there is more than one government, this has two main effects. Each government receives a smaller share of the revenues in the collusive and in the non-collusive outcome. In general, this makes the outcome

of an increase in the number of governments indeterminate. However, if the players revert to the Nash equilibrium of the stage game, each government's revenue becomes zero, independent of the number of governments. The first effect therefore strictly dominates here. This observation has two implications. Firstly, the gain from deviating increases for each government (since by having a small share of the revenues each government would gain more by capturing the federation tax base). Secondly, for each government, the benefit from maintaining the collusive outcome is reduced because it receives an ever reducing share of the collusive revenues. This implies that the short-run gain from deviating increases, while the long-run benefit of maintaining the collusive outcome is reduced. The results in Propositions 1 and 2 have been shown only for the case in which all players revert to the unique Nash equilibrium in the stage game for all future periods if one of the players deviates from the efficient equilibrium with maximum tax revenue. Collusion might be sustained for lower discount factors if more sophisticated punishment strategies are considered. However, the reversion to the non-cooperative stage game equilibrium seems to be a simple and natural benchmark for a comparison of unitary and federal states.

3 Revenue sharing

A central aspect of our analysis is the fact that each level of government acts independently. While this certainly describes well the situation in many developing and transition countries, a number of recent contributions found that differences in the organisation of federal fiscal relations can have strong effects on investment and growth. In particular, Jin et al. (2004) have stressed the importance and the positive impact of revenue sharing agreements in China. The effects of such sharing rules for the sustainability of collusive efficient outcomes can also be analysed. Let only one government level, say $i = 1$, choose the aggregate tax t. Let the resulting tax revenue be

shared equally among all governments, i.e., $t_k = t/n$ for all $k = 1, ..., n$.

Again, an equilibrium with efficient investment and zero after-tax profits for the firm can be sustained with a sufficiently low discount rate. The tax $\hat{t}$ set by government 1 in this equilibrium is exactly the same as in section 2. Consequently, the tax revenue received by each level of government is also the same as in the collusive outcome with n individual taxes. Since the overall taxes and tax revenues are the same, the firm's payoff is again equal to zero and each government's payoff, including government 1's, is given by (9). However, the sustainability of the equilibrium with investment is changed. If government 1 chooses to deviate, it takes the entire period revenue of the firm, but gets to keep only $1/n$-th of the revenue. Hence, the government's deviation payoff, again denoted by $\bar{T}^1$, is

$$\bar{T}^1 = \frac{a^2}{2n}. \tag{16}$$

To find the critical discount rate that allows collusion to be sustained under revenue sharing, we must again compare the payoff from deviating with the collusion payoff

$$\frac{a^2}{2n} > \frac{1}{1-\delta}\frac{1}{2n}\frac{a^2}{2}. \tag{17}$$

Solving this inequality for the critical δ we find that tacit collusion can be sustained for all

$$\delta > \frac{1}{2}. \tag{18}$$

Comparing (18) with (11) gives our next proposition:

Proposition 4 *For any number of government levels n, revenue sharing can sustain efficient investment and maximum taxation as a symmetric stationary equilibrium, with the non-cooperative stage game as trigger strategies, for lower discount factors than in the case of independent taxation by the different levels of government.*

The immediate gain from deviating has to be split with the other levels of government. This makes it less attractive to deviate. The result provides an

insight of why appropriate organisation of inter-governmental fiscal relations with monopolized revenue collection, however, with reliably institutionalized sharing rules, have been successful in attracting investment and generating tax revenues. The critical discount factor with revenue sharing (18) reveals another interesting property. Since (18) is independent of the number of government layers, we can directly summarize the effect of increasing the number of government layers in the case of revenue sharing:

Proposition 5 *With revenue sharing, the sustainability of an equilibrium with efficient investment is independent of the number of government layers in the host country.*

This contrasts with Proposition 3. In the case of revenue sharing, the negative effect of an increase in government actors can be avoided. Federalism with tax revenue sharing rules avoids the problems identified for multiple government layers with independent power to tax.

These results show that revenue sharing can play a beneficial role in overcoming the hold-up problem in foreign direct investment. This contrasts with the more critical view on revenue sharing more generally, which has been articulated, in particular, for horizontally related leviathans as in Brennan and Buchanan (1980), which maintains that revenue sharing rules are a way for leviathan governments to stabilize cartels between them. Indeed, revenue sharing facilitates collusion, but this collusion includes the investor and overcomes a dynamic inefficiency. Such revenue sharing schemes have also been criticized for generating insufficient incentives for government that collects the taxes to choose sufficient tax collection effort, particularly if this effort is not perfectly observable: the government often pays the full marginal cost of additional administrative effort, but receives only a share in the marginal tax revenue, and this yields moral hazard incentives.[8]

[8]For instance, for Germany, see Baretti, Huber and Lichtblau (2002).

This reveals a trade-off when choosing between independent revenue collection and revenue sharing. Advanced countries have typically developed other institutions that can overcome the hold-up problem, so that the positive effects of such schemes for FDI are not so important. In countries with weaker institutions, appropriately designed and reliable sharing rules can play an important role in overcoming the hold-up problem, and the commitment benefits may outweigh the disadvantages that revenue sharing might have. Of course, the viability of implementing well-functioning sharing schemes itself relies on the capability of the government layers involved to stick to the agreed scheme. This need not be the case. After all, this is a commitment problem that is not too different from the commitment problem that generates the hold-up problem. As Shleifer and Treisman (2000) describe, this lack of commitment has been precisely the problem in Russia, where higher levels of government have frequently readjusted transfers or sharing agreements with lower levels of government. Countries in which the different layers of government can commit vis-a-vis each other on a revenue sharing regime also improve their ability to enter into a collusive equilibrium to overcome the hold-up problem with respect to FDI.

4 Conclusions

Federalism and decentralization are often seen as appropriate tools for overcoming the hold-up problem in FDI. Our analysis challenges this view. Recent work has emphasized the potential vertical tax externalities in federal systems. Taking these externalities as given, we asked whether tacit collusion between the investor and the governments of the different layers is feasible in an infinite horizon game and whether a larger number of governments helps to overcome the problem. For a particular class of tacit collusion equilibria we have shown that it does not: cooperation is more difficult to sustain in more decentralized federations.

However, an appropriate and reliable system of revenue sharing can effectively reduce the problems of multi-level government. With revenue sharing, the negative effects of federalism on the sustainability of investment disappear. Contrary to the perceived wisdom, a reduction in the competition between levels of government caused by the introduction of revenue sharing can be conducive to foreign investment. Thus, decentralization is not per se good or bad for investment, but its effects depend on the organisation of the inter-governmental fiscal relations. Our results are in line with the recent success of the Chinese and failure of the Russian federal systems to attract FDI.

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